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ABSTRACT

Since a great number of variables influence future educational outcomes, forecasting possible trends is a complex task. One such model, the cross-impact matrix, has been developed. The use of this matrix in forecasting future values of social indicators of educational outcomes is described. Variables associated with educational outcomes are used in the matrix. A review of the research on variables influencing outcomes of education indicated that two variables had strong support from research: socioeconomic status and students' general ability. Some support was also found for the following variables: family expectations, attitudes and aspirations; peer group characteristics (student body); student's self-concept; student's attitudinal and motivational factors (including fate control): teacher training; teacher experience; teacher expectations; and teacher behavior in the classroom. Instruments that may be used to measure some of these variables are identified. An inter-disciplinary faculty panel identified educational issues requiring policy decisions within the next five to ten years. These issues included: the school's responsibility to solve social problems, maintenance of current standards with reduced funding, state subsidy of higher education, encouragement of alternative schools, increasing crime, and loss of confidence in schools. (Author/MV)

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COMPONENTS OF A MODEL FOR FORECASTING FUTURE STATUS OF SELECTED SOCIAL INDICATORS

Technical Report No. 3
Department of Education Project
on Social Indicators

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COMPONENTS OF A MODEL FOR FORECASTING FUTURE STATUS OF SELECTED SOCIAL INDICATORS

The work specified for phase 2 of the Department of Education Project on Social Indicators is "To predict the future status of selected social indicators, using the assumption that present policies will be continued." Note that the title of this report refers to forecasting rather than predicting. The choice of words is deliberate and is based on the work of futurists. Joseph (1974) made the distinction: "Forecasting differed from prediction in that its results tell us what can happen, what we can change, or what we can bring about, whereas prediction makes a statement of what will happen. That is, forecasts make predictive statements about what will happen if . . ." Because forecasting holds greater possibilities for policy determination, we have substituted forecast for prediction.

The simplest and most direct way to forecast the future status of selected social indicators is through the use of a Delphi technique. Using this approach panels of informed individuals would be asked to forecast the future status of indicators. The results of their forecasts would be fed back to them and individual panel members would be asked to modify their forecasts. Through a series of iterations, some consensus on forecasts could be projected. However, the future status of a social indicator related to educational achievement involves a multiplicity of interacting variables. A panel member would find it extremely difficult to consider all of these variables as he made his forecast. As a result of such complexity, Kane (1972) concluded: ". . . decisions are usually made in truncated spaces by sharply reducing the variables that will be considered." In order to consider a broader range of variables, an alternative methodology has been developed.

Methodology for Forecasting Social Indicators And Making Policy Recommendations

The methodology employed is based on the fact that a number of variables will influence the status of social indicators related to educational outcomes. These variables in turn are influenced by each other and by conditions within society. These intervening variables are independent in regard to educational outcomes but dependent in relation to forces within society. Thus they have been designated as "influencing variables" and consist of two types: in-school and out-of-school. An illustration of the effect of an out-of-school influencing variable is provided by information in a recently released publication, America's Children 1976: "During 1974, about one in six children in America lived in families whose income was below the official poverty level . . . . This compares with about one in seven children in 1970." (Associated Press, 1976) Research shows that socio-economic status of children is associated with their achievement as measured by standardized test scores. Had the increase in the percentage of children living in poverty been forecast in 1970, a decline in standardized test scores could also have been forecast. Looking ahead, if the percentage of children living in poverty continues to increase, the scores on achievement tests will continue to decline, assuming that other variables remain constant and unless some countervailing actions are taken.

Therefore, in order to forecast educational outcomes as measured by social indicators, it will be necessary to forecast the impact of the influencing variables on the outcomes. These influencing variables, however, will in turn affect each other and be affected by various social and economic changes. For example, the variable of socio-economic status will be affected by unemployment rates and inflation. Some of the social and economic changes will produce issues that will need to be resolved by legislators or other decision-makers. Through the use of the proposed

forecasting methodology, the impact of alternative decisions on educational outcomes can be forecast. Figure 1 is a schematic representation of the elements that make up the methodology and the ways in which these elements are interrelated.

Identifying influencing variables. A first step in the methodology was to identify variables that influence educational outcomes. Research studies on possible variables were examined. Because the research results are not conclusive, it seemed necessary to engage a panel of faculty members from the University of Florida (see Appendix A) to indicate what they considered to be the most important variables. A review of the research on variables and a summary of the variables to be used in this study are included in the paper. (pp. 10-29)

Constructing and using a cross-impact matrix. Given the variables identified and a specified social indicator* it will be possible to construct a series of cross-impact matrices based on the work of Delkey (1972) and Kane (1972). The impact of each variable on every other variable and on the social indicator is estimated. The cross-impact matrix in Figure 2 is included for illustrative purposes only. The variables identified through the systematic review of research are listed on the matrix. One social indicator, NAEP reading scores for 13-year olds, is also included. The matrix shows the force or power of one variable on another. In Figure 2 the force of variables in the column on the variables in the rows is designated on a scale from "0" for no force to "++" for moderate to strong force. A single "+" is used to designate a slight force. For example, it is estimated that "family expectations and aspirations" have a slight influence on "peer-group characteristics" and a more pronounced influence

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*Data on the social indicators to be used are to be supplied by the Department of Education.

Figure No. 1

Schematic of Methodology Used
in Forecasting

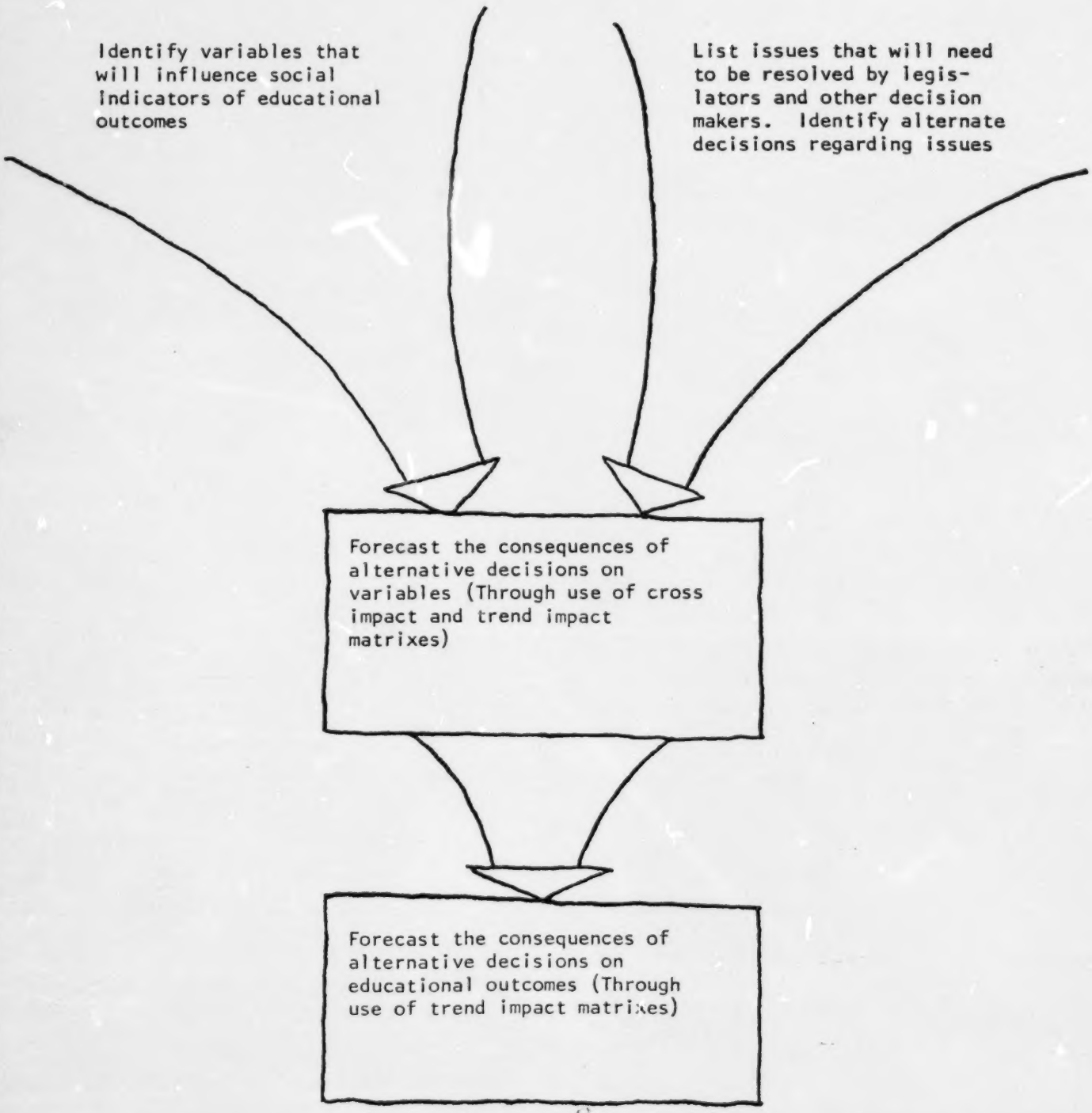
Identify variables that will influence social indicators of educational outcomes
List issues that will need to be resolved by legislators and other decision makers. Identify alternate decisions regarding issues
Forecast the consequences of alternative decisions on variables (Through use of cross impact and trend impact matrixes)
Forecast the consequences of alternative decisions on educational outcomes (Through use of trend impact matrixes)

Figure 2

CROSS IMPACT MATRIX

	Family expectations, attitudes, and aspirations	Peer group characteristics	Socio-economic status	Student's general ability	Student's self-concepts	Student's attitudes and motivation	Student's fate control	Teacher expectation	Teacher experience	Teacher behavior in the classroom	Teacher training	NAEP reading scores-13-yr. old
Family expectations, attitudes, and aspirations	0	0	++	+	+	+	0	0	+	0	+	+
Peer group characteristics	+	0	+	0	+	+	0	0	0	0	0	+
Socio-economic status	+	0	0	0	0	0	0	0	0	0	0	0
Student's general ability	0	0	+	0	+	+	+	+	0	0	0	0
Student's self-concepts	++	++	++	++	0	+	++	+	+	++	+	+
Student's attitudes and motivation	++	++	++	+	++	0	++	++	+	++	+	+
Student's fate control	+	++	++	+	++	++	0	+	0	++	+	+
Teacher expectations	++	++	++	++	++	++	+	0	0	0	+	+
Teacher experience	0	0	0	0	0	0	0	+	0	0	+	+
Teacher behavior in the classroom	+	+	+	++	+	+	+	+	0	0	+	+
Teacher training	0	0	0	0	0	0	0	+	+	0	0	0
NAEP reading scores-13-yr. old	++	+	++	++	++	++	+	+	+	0	+	0

on "student's self-concepts."

Using the procedure illustrated by Figure 2, it will be possible to forecast the impact of the variables identified in this study on a series of social indicators. A computer program developed by The Futures Group and being implemented by the Department of Education will be used to improve the internal consistency of the cross-impact matrices. Through the combined use of this matrix and trend impact analysis, it will be possible to forecast the value of an indicator over time. A computer program for trend impact analysis is now being implemented by the Department of Education and may be available for this purpose (Kane, 1972).

Studying effect of policy decisions on social indicator(s). It is possible to add a new element, "intervention," to the matrix developed earlier. Various "interventions" in the form of policy decisions can be used to modify the matrix. The resulting changes in the status of the social indicator can then be forecast over time through the use of the computer program. Thus it should be possible to forecast the impact of alternative policy decisions on selected social indicators.

In order to conduct this part of the study, a first step was to identify the issues that are likely to require policy decisions in the future. The University of Florida panel associated with the study has assisted with this. A list of the issues identified by the panel are included in the next section of this paper.

Identification of Issues to be Resolved

The identification of issues to be resolved by Florida legislators and other decision-makers was done by the panel in consultation with futurist, Dr. Jay S. Mendell from Florida International University. Dr. Mendell played the role of provocateur in helping the panel come to grips with the forecasting problem. His approach is based on the assumption that experts in any field, given sufficient provocation, are likely

to find within themselves images of the future which include the important issues that will face policy-makers in their area. These issues are then refined in small group sessions in which they are analyzed to bring specific issues more clearly into focus. Larger issues to which these relate are identified, as are more narrow issues which they subsume.

The panel spent an evening and the following day engaged in intensive discussion, first of their views of the future and then of the issues themselves as they emerged from the discourse. Once underway, the process yielded a number of issues that will certainly face Florida policy-makers in coming years. The decisions that are made will have an impact upon the variable which influence educational outcomes and will be reflected by changes in social indicators. The process by which the issues can be linked to the influencing variables has already been described. The use of the cross impact matrix and trend impact analysis will give Florida policy-makers a way to estimate the relative impacts of alternative policy decisions on educational outcomes.

The issues identified by the panel as requiring policy decisions within the next five to ten years are listed below. They are grouped under two broad categories, issues directly related to education, and broader issues which are seen to have possible implications for education but which are not exclusively educational in scope. The issues relating directly to education were:

1. To what extent should schools be expected to solve social problems?
2. If current economic trends continue, how can schools maintain current standards with less money?
3. To what extent should the state subsidize higher education?
4. How can the socialization of youth best be carried forward? Should schools bear the entire burden?
5. Should society support education for life-long, self-renewing learning?

6. What will be the impact on schools of commercial "growth centers" claiming to help youth solve their socialization problems better than schools can?

7. Should state resources be concentrated on supporting all educative agencies instead of just schools?

8. Should the alternative schools movement be encouraged?

9. How can society and schools cope with the increasing problem of lawlessness?

10. How can confidence be restored in schools as institutions?

11. Should vocational training programs in industry be increased? If so, at whose expense?

12. Should each community have a board of community education responsible for setting goals, coordinating programs and allocating resources?

13. Should the number of years of compulsory schooling be reduced? Should compulsory education be abolished altogether?

The broader issues which might have impacts on educational policy were:

1. How shall we meet the challenges of an aging population in Florida?

2. What must be done, both ecologically and socially, to enable Florida, a sub-tropical state, to successfully cope with urbanization?

3. How can Florida provide for orderly economic growth?

4. Should Florida seek to industralize?

5. What energy resources should be used in Florida's industries?

6. How should Florida supply industry's labor needs?

7. Should tax incentives be given to attract "desirable" industries?

8. Should legislative decisions attempt to reverse the trend of the growing disparity between social classes?

9. How can we assure employment opportunities for trained manpower?

10. How can the state restore confidence at a time when trust in institutions is at a low ebb?

11. What should be the future policy on incarceration of felons?

12. What should be done about institutions which fail to sustain themselves in the normal course of events? e.g. Lockheed, New York City, etc.?

13. What provisions should be made for inducting youth into the world of work?

14. What level of support should the state provide for welfare?

15. Should the state attempt to control the spread of V.D. by a system of compulsory physical examination?

A brief perusal of the list will reveal the interrelated nature of these issues. A sub-committee of the panel spent its time dealing with what it saw as the larger issue subsuming many of those stated above and revealed by many early warning signals already apparent in society. Their feeling was that this larger issue should become the focus of policy-makers because its solution would in turn ameliorate many of the immediate lesser issues.

The issue they identified was: What should be done to assist the citizens of Florida in developing appropriate processes for identifying and solving "means" problems and "values" problems? As stated in the issue, "values" are seen as ultimate goals and "means" are intended as the means used to achieve the goals. The following are some of the symptoms which the sub-committee felt were indicative of the larger underlying issue:

The debates over energy use and sources

Inflation

Poverty

The alienation of various groups in society

Civil disobedience

Recurring crises in the financial community

Loss of faith in institutions, in rational processes, in leaders and in one's fellowman

The sense of loss of control over one's life

The debate over the right to privacy

Increasing ambiguity of roles

The lack of ability of teachers to cope with the mix of social classes in urban schools

Having identified these issues, part of the work of this project during the next phase will be to select the more salient issues to be used in the forecasting model described elsewhere in this paper. The model is designed to enable policy-makers to forecast the impacts on educational outcomes of alternative decisions on the issues.

Variables That Affect Educational Outcomes: A Review of Research Literature

The purpose of this section is to present the basic findings of the review of research literature on variables that affect educational outcomes. This review is not an exhaustive one but it includes the basic studies done in this broad area. In order to attain the objective, primary sources were used as well as previous reviews.

Educational outcomes are generally divided into two categories: Cognitive and noncognitive. The former includes intellectual processes while the latter includes motivation, attitudes, social skills, self-concept, learning styles, etc. Although educators recognize the importance of both kinds of outcomes, most of the research done concentrates on the variables that affect cognitive outcomes, and little research has been directed toward discovering variables associated with noncognitive outcomes. Furthermore, most of the studies have considered cognitive achievement as measured by standardized achievement tests. Consequently, the available research is directed toward discovering variables associated with cognitive achievement as measured by standardized achievement tests.

Basic Approaches

Averch, et al. (1972) classified the research done in this area into five different approaches: (1) the input-output approach; (2) the process approach; (3) the organizational approach; (4) the evaluation approach; (5) the experiential approach.

The input-output approach views the school as a channel through which resources (inputs) flow to the students and from which some output flows, usually defined in terms of cognitive achievement as measured by standardized achievement tests. The researcher tries to answer the question: To what extent is the variability in educational outcomes due to variations in resource levels? He collects a body of data at a given point in time, usually applies multiple regression analysis and tries to make inferences about the effects of the inputs on the educational outcomes. The Equality of Educational Opportunity survey by Coleman, et al. (1966) is an example of this kind of research.

In the process approach what matters are the processes by which the resources are applied to the students and the responses of the students to those processes. The main purpose of this approach is to expand the knowledge of the nature of educational processes and to determine the factors affecting educational outcomes. The researcher conducts small-scale experiments, either in the laboratory or in the classroom.

The organizational approach assumes that improvement in the functioning of educational organizations, such as schools, results in better educational outcomes. The school is seen as having to adapt to the needs of an ever changing body of students and to changes in outside forces, such as social demands. The inputs are the rules, procedures, incentives and so forth set up within the system. The purpose of this approach is to understand the behavior of the whole system and to describe the structure of the school and how and what happens to the people in it. Research here primarily uses the case-study method. Averch, et al. (1972) pointed out that this approach is relatively undeveloped as compared with the others.

Studies within the evaluation approach consist of ex post facto analyses of comprehensive educational interventions in existing schools. Researchers

that use this approach look for the effects of a general intervention upon educational outcomes. No attempt is made to determine why or how an intervention affects outcomes. The surveys of compensatory education illustrate this approach.

Those who use the experiential approach are concerned with what happens to students in schools as an end in itself. As Averch, et al. (1972) said "the primary emphasis is on the effects of school experiences on student's self-concepts and on their relation to other people and to social institutions" (p. 11). The research within this approach is frequently provided by participant observers in terms of descriptions of their experiences. The works by Silberman, Holt, and Illich illustrate this approach.

The literature reviewed for the purpose of this section is representative of all these approaches. For practical purposes, it will be presented in integrated form and no reference will be made to the approach used by specific studies.

Family background

The socio-economic charactersitics of the student's family are strongly related to his academic achievement (Armor 1972; Averch, et al. 1972; Boocock 1966; Coleman, et al. 1966; Jenks 1972; Mayeske and Benton 1975; Mayeske, et al. 1972, 1973; McDill 1967; Summers and Wolfe 1975). The results are consistent across studies. The higher the socio-economic status of the student's family, the higher his academic achievement and educational aspirations. This relationship seems to hold no matter what measurement of socio-economic status is used. The usual measures, however, are the education and occupation of the head of household.

Averch, et al. (1972) indicated that a student's academic achievement can be predicted approximately 15 percent more accurately if his family's socio-economic status is known. The importance of this factor was described by Coleman, et al. (1966) as follows:

> The first finding is that the schools are remarkably similar in the way they relate to the achievement of their pupils when the socio-economic background of the students is taken into account. It is known that socio-economic factors bear a strong relation to academic achievement. When these factors are statistically controlled, however, it appears that differences between schools account for only a small fraction of differences in pupil achievement. (pp. 21-22)

The hypothesis that the role of family background factors in achievement exceeds that of school factors has also been supported by Armor (1972); Jenks (1972); Mayeske, et al. (1975); Smith (1972).

There is little evidence to support the hypothesis that the structure of the family (the size of the family, number of parents in the home, etc.) exercises a strong independent influence on the student's achievement. After an extensive and complex analysis of the data of the Equality of Educational Opportunity survey carried out by the U. S. Office of Education, Mayeske and Benton (1975) concluded that:

> For most students, the relationship of family structure with achievement tends to be moderate or low. Most of this relationship can be accounted for by variation in socio-economic status: the lower it is, the less likely the family is to remain intact. (p. 125)

Although it is generally accepted that family expectations, attitudes and aspirations regarding life and education have a strong influence upon the student's achievement, this has not been well substantiated by empirical evidence. Little has been done in clarifying the nature and strength of this relationship. The strongest support comes from the work my Mayeske, et al. (1972). They studied a series of variables in what they referred to as "Family Process Set" and discovered that the ones with the strongest relationship with achievement were educational plans and desires and attitude toward life. They also found that both relationships persisted even after all the other variables had been taken into account. They concluded that their study demonstrated that family background plays an important role in the student's achievement, not only through social and economic well-being, but through the values its members

hold regarding education and the activities that parents or caretakers engage in with their children to make these values operational.

Sex

One may expect differences in achievement between sexes if cultural influences such as role expectations, social norms and other sex-related personality characteristics are considered. Khan (1976) presented evidence which indicated that correlations between predictors and achievement for females are higher than similar correlations for males. Simons and Bibb (1974) found significant sex differences in underachievement: that is, there were more male underachievers than females. Summers and Wolfe (1975) pointed out that a student's sex is related to his achievement at all school levels. In elementary school, they found that females do better than males. In junior high school, only low ability males do more poorly than low ability females. In senior high school, males of average ability or less do better than females with equivalent ability. On the other hand, in their extensive analysis, Mayeske and Benton (1975) found that sex is not a major source of differences among students in achievement and motivation. Thus there does not seem to be a clear relationship between sex and achievement.

Racial-ethnic group

The existence of ethnic differences in educational achievement has been pointed out by many studies (Armor 1972 ; Coleman et al. 1966 ; Boocock 1966 ; Pollard 1973). Negro students and other minority groups are lower in academic achievement than white students. This relationship seems strong when certain other variables are not controlled or taken into account. Armor (1972) and Mayeske et al. (1973) indicated that most of these differences can be explained in terms of family background. Mayeske, et al. (1973) found that when "Family background, area of residence and various aspects of the school attended were taken into account, the degree of variations in achievement that could be

attributed to racial-ethnic group membership dropped to 1 percent or less" (p. 147)

On the other hand, Jensen, (1969) provided evidence that supports the importance of racial membership in the student's achievement. He indicated that there are innate differences in ability between different racial groups. His findings and his inferences are a matter of much controversy and more research is needed before any valid conclusion can be reached.

Thus it seems that we cannot make inferences about the independent effect of racial-ethnic group membership in achievement and motivation by our present state of knowledge.

Region and type of community

There are some indications that the region and the type of community in which a student lives affects his educational outcomes. The National Assessment of Educational Progress indicates differences in student's academic achievement and attitudes between different regions in the United States (Johnson 1975). Boocock (1966) described a study done by Rogeff in which it was found that there was a relationship between the structure of the community and the educational aspirations and scores on a scholastic aptitude test of a group of students. She also pointed out that the Project Talent data suggest that different types of communities may foster or emphasize different types of achievement by able students.

On the contrary, Mayeske and Benton (1975) found that the region of the United States in which a student resides has little effect on his level of achievement or motivation. Regional membership was found to account for only about 5 percent of the total student variations in academic achievement. They also concluded that the observed regional differences in academic achievement can be explained in terms of the regional averages in socio-economic status, motivation and type of school attended, either singly or in any combinations.

School resources and facilities

Most studies generally agree that school resources and facilities account for relatively little variation in pupil achievement (Armor 1972; Averch, et al. 1972; Coleman, et al. 1966; Jencks 1972; Lyle 1967; Mayeske, et al. 1972, 1975; McDill, et al. 1967). Most studies refute the notion that per pupil expenditures are the key determinant of pupil achievement. The lack of evidence of the influence of school resources and facilities on the student's achievement was supported by Averch, et al. (1972):

> When we examine the results across studies we find that school resources are not consistently important. The particular resources that seem to be significant in one study do not prove to be significant in other studies that include the same resources in the analysis. (p. 148)

Coleman, et al. (1966) pointed out that variations in facilities and curricula of schools usually account for little variation in student achievement; however, they account for more variation of student achievement within minority groups than within the majority white group.

One of the variables that has been considered in some of the studies is class size. Reviewing the literature of the relationship between class size, and achievement, Boocock (1966) concluded that research in this area is rather inconclusive. McDill, et al. (1967) found a low correlation between this variable and the academic achievement of the students. On the other hand, Summers and Wolfe (1975) found a relationship between class size and achievement. They found that classes of 27 or fewer were helpful for low-ability elementary students and that classes of 34 or more appeared detrimental to everyone.

Another variable that has been considered by some researchers is school size. In this case, as well as in class size, the results across studies are inconsistent. Boocock (1966) presented some studies which reveal contradictory findings. One step toward a better understanding of the relationship

between school size and student achievement was carried out by Summers and Wolfe (1975). Analyzing this relationship by different groups of students, they found that the effect of the size of the school varies with the kind of students. Smaller schools apparently were associated with higher achievement particularly for elementary and senior high students. Black and elementary school students and low-ability high school students seemed to benefit most from smaller schools. The type of analysis they followed in clarifying this relationship as well as others seems fruitful, although their findings are far from being conclusive.

Teacher characteristics

In their extensive review of literature, Averch, et al. (1972) found that although there is considerable research conducted on teacher characteristics and their influence on student performance, little can be concluded from them. They indicated that one of the limitations in these studies is that student achievement has rarely been used as a criterion. Other criteria, such as supervisors or fellow-teacher ratings, are not appropriate since these ratings do not correlate with student achievement.

On the teacher characteristics studies, there does seem to be evidence that the teacher's training and experience are related to student achievement (Boocock, 1966; Coleman, et al. 1966; Lyle 1967; Mayeske, et al. 1972; Summers and Wolfe 1975). Coleman, et al. (1966) found that the quality of teachers shows a strong relationship to pupil achievement. They also found that this relationship is progressively greater in higher grades, indicating a cumulative effect of teacher qualities in the student's academic achievement. The teacher quality appeared to be more important to minority than to majority students. Among the teacher characteristics measured in the survey, those that had the highest relationship to student achievement were, first, the teacher's score on the verbal skills test and then his educational background.

In their reanalysis of the data used by Coleman, et al., Mayeske, et al. (1972) found that teacher attributes highly related to the school outcomes were those associated with the teacher's experiences in racially imbalanced educational settings. Black teachers attended predominately non-white educational institutions. The result is a less adequate preparation than that received in predominately white institutions.

In the study done in Philadelphia public schools, Summers and Wolfe (1975) found that students in elementary school did better with teachers from higher rated colleges and universities, especially those students in the low income group. They also found that the length of experience of the teacher had a different impact on high and low-achieving students. At all school levels, high achievers were found to do best with more experienced teachers. Surprisingly, low achievers in elementary school were found to do best with relatively inexperienced teachers. Education of the teacher beyond the bachelor's degree was not related to better student achievement.

Teacher-student interaction

The state of knowledge about teacher-student interaction and its influence on student's educational outcomes was described by Boocock (1966) as follows: "There does not seem to be any one type of teacher or teacher-student relationship that is best for all kinds of learning and all kinds of students." (p. 8) A similar conclusion was presented by Averch, et al. (1972) who found studies that indicated that some teachers do better with certain types of students and that there is no single best or right way to teach.

In a review of literature, Soar (1972) found a relationship between teacher indirectness (student freedom) and criticism and student educational outcomes. This relationship is not linear and is rather in the form of an inverted "U". "Up to some point, increasing indirectness leads to greater subject matter growth and more favorable attitudes, but beyond that point, further increases

in teacher indirectness lead to decreased subject matter growth and less favorable attitudes." (p. 187)

The appearance of an inverted "U" in the relationship between teacher control and student growth suggests the possibility that more than one process or mechanism is involved in this relationship. This phenomenon should be studied more carefully by educational researchers.

Soar (1972) also found that the research in this area suggests that the kind of teacher behavior is associated with the level of complexity of the achievement. Gain in simple concrete kinds of achievement, such as memory of facts, is positively related to closely supervised classroom activity; whereas, gain in more complex abstract achievement, such as development of concepts and principles and creative work, is positively associated with greater amounts of student freedom.

Rosenthal and Jacobson (1968) pointed out the importance of teacher expectations on student educational outcomes. However, their research has been criticized in its methodological aspects and more recent studies have failed to replicate their findings. Dusek and Connell (1973) found as a result of their study that neither biasing statements nor false test scores given to teachers affect children's test scores. However, they point out that the findings suggest that teachers' own expectations of student's performance are related to the way teachers treat different groups of students. This may influence student's self-concept and classroom performance.

Averch, et al. (1972) concluded that studies suggest that teacher expectations probably influence teacher and student behavior and may influence student achievement, but that more research is needed to determine the strength and nature of this relationship.

Student-body characteristics

The literature about the influence of the student-body (peer group) on

the academic performance of individual members presents inconsistent findings. In the Equality of Educational Opportunity survey, Coleman, et al. (1966) concluded that a student's achievement is strongly related to the educational backgrounds and aspirations of other students in the school. Children from a given family background will achieve at different levels when put in schools with different social composition. In their reanalysis of Coleman's data, Mayeske, et al. (1973) corroborated these conclusions. They also found that although there is considerable correlation between the achievement-motivational composition and the social composition of the student-body, the former has the greater influence. Consistent with these findings, McDill, et al. (1967) found that in those schools in which academic competition, intellectualism and subject matter competence are emphasized and rewarded by faculty and student-bodies, individual students tend to achieve at higher levels.

Summers and Wolfe (1975) presented data that supports the influence of the student-body characteristics on the academic achievement of individual members. They found that the proportion of either high achievers or low achievers in a school can influence the student's school performance. The more heterogeneous the composition of the student body was in terms of abilities, the higher the achievement of the student body. They also found that both black and non-black students tend to have higher achievement levels when schools are racially balanced than when they are mostly segregated.

On the other hand, Smith (1972), after a reanalysis of Coleman's data, concluded that there is no evidence that the characteristics of the student body have a strong independent influence on the achievement of individual students. He concluded that the student selection and school assignment policies cause the association between student body characteristics and achievement.

In their review of literature, Averch, et al. (1972) concluded that there is no strong evidence to support the hypothesis that student-body effects

exist nor is there strong evidence to the contrary. They added that the controversy over the existence of student-body effects results from research methological considerations. "So long as production-function research is based on data generated by natural experiments, it will be difficult, if not impossible, to isolate completely the relative contributions of school resources, background factors, and peer-group influences." (p. 44)

Thus it seems reasonable to conclude that the role of the student body on the achievement of individual students is not yet known. At the same time, the existence of student body effects on student academic achievement is hypothesized.

Student's self concept

The student's self-concept, or what the student believes he is, has been studied in terms of influence on school performance. In his review of this research literature, Purkey (1970) found that the relationship between the self-concept and academic achievement can be divided into three categories: (1) the relation between the self and success in school; (2) how the successful student views himself; and (3) how the unsuccessful student sees himself. He found that the research clearly indicates "a persistent and significant relationship between the self-concept and academic achievement." (p. 15) The relationship is clear for boys but less so for girls. Successful students are generally characterized by positive self-concepts and tend to excel in feelings of worth as individuals. On the contrary, underachievers, non-achievers, or poor readers are likely to see themselves as less able, less adequate and less self-reliant than their more successful peers.

In a study of educational achievement and ethnic group membership, Pollard (1973) found that the only personality variable that correlated consistently with achievement in all five ethnic groups was the self-concept of ability. It was the only variable that differentiated high achievers from low achievers in

both reading and arithmetic.

Although research in the self-concept has many limitations, it seems clear that this variable influences student educational outcomes.

Student's general ability

Although most people agree that general intelligence or ability influences academic achievement, this generalization is a matter of some controversy among researchers. Low correlations between mental test scores and learning have been found in some studies (Cronbach, 1970). On the other hand, some authors point out that general ability appears to be the single most effective predictor of school achievement (Entwistle 1972; McDill 1967). Cronbach (1970) explained this inconsistency of findings in terms of the kinds of learning considered.

> First, it is true that in instruction that presents connected materials-whether by a programmed text, a live teacher or some more exotic method-the pupils high in mental age learn more than those low in mental age. Hence MA does represent one kind of ability to learn. When, however, the material is rote in nature, and no meaning can be supplied by the learner (as in many laboratory tasks) good general ability gives little or no advantage. There is some reason to think that rote memory is a separate ability. Good performance on a truly rote task may occur as often among those we call 'dull' as among the bright. (pp. 293-294)

Cronbach (1970) also presented evidence of interactions between general ability and instructional method. Instructional methods or treatments can be found to be differentially effective on the basis of the level of the student's general ability. This can explain in part the failure in educational research to demonstrate positive effects due to new treatments or instructional innovations.

Other student's attitudinal and motivational factors

In the Equality of Educational Opportunity survey, Coleman, et al. (1966) found that a set of three attitudinal measures accounted for more achievement variability than any other set of variables. These attitudinal measures were (1) the student's interest in school and his reported reading outside school; (2) the student's self-concept, especially with regard to learning and success

in school; and (3) the student sense of control over his own destiny. Of these attitudinal measures the one that was found to have the strongest relationship to achievement was the student sense of control over his own destiny.

In their reanalysis of the data used by Coleman, et al., Mayeske, et al. (1973) found evidence that supports the existence of a relationship between student's attitudinal and motivational factors and academic achievement. Among these factors the most important were the student's expectations of his performance in school and his attitudes as to the importance of hard work for success and how an education might benefit him.

A particular aspect of motivation that has been considered in many studies is achievement motivation or the need to achieve. Although this variable has frequently been associated with school performance, a consistent, direct relationship has been difficult to demonstrate. Pollard (1973) indicated that this is due partially to the problems in conceptualization and partially to the possibility that other variables mediate the effect of achievement motivation.

In a review of research about the prediction of achievement from a measure of achievement motivation, Klienger (1966) reported that of five studies, two report that children with high achievement motivation scores had significantly higher achievement than those with low scores in achievement motivation. The other three studies report that achievement motivation scores did not differentiate high from low achievers.

In a recent study, Simons and Bibb (1974) estimated what they called a "resultant achievement motivation index." This index was obtained by combining an individual's need to achieve with his test anxiety score and was supposed to represent a single measure of overall motivational character. It was discovered that the resultant achievement motivation index was associated with student achievement. This index is interpreted in terms of hope of success or fear of failure. The author concluded that "the hope of success was significantly

associated with high or superior academic achievement while fear of failure was significantly associated with underachievement." (p. 366)

Summary and critique of research on variables

Most research has demonstrated that the largest percentage of the variance in student's educational outcomes is associated with student characteristics. Student's socio-economic status as well as his self-concept, other attitudinal and motivational factors and his general ability seem to be very important in explaining variability in student academic achievement. On the other hand, a small percentage of that variance has been associated with school variables. Research has not identified a set of educational practices and/or resources that consistently relate to student's educational outcomes. A practice that seems to be effective in one case is apparently ineffective in another.

This does not mean that school does not affect student educational outcomes. Most research compares variables and educational outcomes across schools and little knowledge is available as to what student's outcomes would be in case they do not attend school at all. There is a need to explore further the influence of the school on some of the variables that have been proved to be strongly associated with academic achievement, such as self-concept, ability and other attitudinal and motivational factors. It is possible that the school affects student's outcomes in many indirect ways.

There have been few studies on the effect of the interactions between student variables and school variables on student's outcomes. Soar (1975) found interactions between pupil socio-economic status and achievement gain for several kinds of teacher behaviors. For example, ". . . teacher criticism of pupil work is negatively related with achievement gain for low SES pupils, but not for high SES pupils; whereas a warm, supportive atmosphere is positively associated with gain for low SES pupils but not for high SES pupils." (p. 3) Summers and Wolfe (1975) studied the question of the interaction between

specific school resources and specific types of pupils. As a result they found more strong school influences on student achievement than in previous studies. Previous research mostly considered the relationship between school variables and the outcomes of all students. Thus it is possible that the positive influence of the school on certain kinds of students may be cancelled by the negative influence on other kinds of students and in this way school influences may be hidden. It is hoped that future researchers following and improving on Summers' and Wolfe's research methods will be able to discover the influence of school in student educational outcomes.

The available research also is limited in other ways. The educational outcomes considered are almost exclusively those associated with cognitive achievement, but this is only one aspect of student learning. Furthermore, research considers cognitive achievement as measured by standardized tests. These instruments are limited since they measure a narrow range of cognitive skills, mostly the lower cognitive processes. Higher cognitive processes such as abstract reasoning, problem solving and creativity among others, are rarely measured very well by standardized tests. Thus of a wide variety of educational outcomes, available research examines only a narrow range of cognitive skills.

Few studies maintain adequate controls over possible variables that can affect achievement, especially variables associated with what goes on in the classroom (Averch, et al., 1973). Most studies do not include data on interactions between student-teacher, student-student, student-subject-matter, teacher-subject-matter, student-teacher-subject-matter and so forth.

Many variables are measured in crude form. Variables such as teacher quality, teacher's ability, student's motivation, etc. are theoretically understood but are difficult to measure. Therefore, we do not know the extent to which inconclusive findings are the result of the researcher's inability to measure the variables included in his analysis.

In general the available research has identified the following as possible sets of variables that affect student educational outcomes:

Strong support from research

Socio-economic status

Student's general ability

Some support from research

Family expectations, attitudes and aspirations

Peer group characteristics (student-body)

Student's self-concept

Student's attitudinal and motivational factors (including fate control)

Teacher training

Teacher experience

Teacher expectations

Teacher behavior in the classroom

Implications of research on variables

The discussion of research on influencing variables may give the impression that the quality of schools or indeed that schooling itself makes relatively little difference in educational outcomes. This is a false impression. Anyone who has studied educational systems in developing countries and has observed their level of social and economic development can attest to the fact that schools make a great difference.

One way to understand the reason for this is to examine more closely one of the variables, the socio-economic status of the child, and the effect of this variable on other variables. With a cross-impact matrix it is possible to forecast the impact of influencing variables on educational outcomes and the impact of the variables on each other. Through the construction of such a matrix (see Figure 2), it was discovered that socio-economic status had a large influence on a number of the other most important influencing variables:

- family expectations and aspirations
- peer group characteristics
- student's self-concept
- student's fate-control
- teacher expectations

In turn, it was discovered that other variables had relatively little influence on socio-economic status.

What then does influence socio-economic status? Typically socio-economic status is defined in terms of the parent's income, level of education and occupation. Parent's income is highly correlated with the amount of education the parent has received. The level of education which an individual achieves depends in large part upon the quality of that education in the early stages. Furthermore, the occupation of a person will be determined to a large extent by the level and quality of education he has received.

Thus we have the interesting situation where the quality and quantity of education will directly influence socio-economic status, which in turn is the most important variable influencing educational outcome. In other words, quality education will enable people to go further in the educational system, prepare for better careers and earn more money. Their increased socio-economic status will be a positive influence on the educational outcomes of their children. Good education improves socio-economic status which in turn improves educational outcomes. America enjoyed several generations of this positive "snow-balling" effect.

Unfortunately, the process can be reversed by starting at any point in the cycle. A drop in the quality of education can result in decreased education, lower level of employment and lower income. The lower socio-economic status which in turn will result in a deterioration of educational outcomes. Similarly this negative cycle can be triggered by external forces reducing

socio-economic status of a sizable portion of the population -- for example, through inflation or prolonged periods of unemployment. The United States seems to be caught up in such a negative cycle. There is little point in arguing over where in the cycle the downward trend originated. The important thing is to reverse the trend by working at both improving the socio-economic status of large sections of our society and improving the quality of education provided.

Variables to be Used in the Forecasting Model

Given the inconclusive nature of the research, a panel of experts on the University of Florida faculty was asked to assist in identifying the variables to be used in this study. The list of variables influencing educational outcomes identified through the review of the research was used as the basis of a modified Q-sort. The panel was asked to scrutinize the list and suggest additional variables which should be included. Discussion of the variables by the panel resulted in the following additions to the list:

Teacher academic standards - as differentiated from the teacher's expectations of student's learning ability

The normative system of the school

Administrative leadership

Student's fate control was identified as a separate variable.

The resulting list of 14 variables was then sorted by each panel member in a four-step forced-choice procedure to yield the single variable each judged to be most significant in influencing school outcomes. The next day a tabulation of the results of the first sorting was presented to the panel and discussed. Each member was given the opportunity to change his choice as a result of his observation of the tabulated results and the ensuing discussion. The tabulation of the final sort was scored using a reciprocal weighting system (see Appendix B). The ordering of the variables through the modified Q-sort

was closely congruent with the results of the research review.

The ten variables having the highest rating were selected to be used as components of the cross-impact matrices and trend impact analysis. These ten variables are listed below with a brief explanation:

1. Socio-economic status of the family - usually measured by level of education and occupation of head of household
2. Family expectations, attitudes and aspirations - the way parents and other family members feel about education and toward life
3. Student's self-concepts - the way the student sees himself
4. Peer group characteristics - attitudes toward school and learning, academic achievement and race
5. Student's general ability
6. Student's fate control - individual's sense of control over his own destiny, his ability to influence the course of his life (locus of control)
7. Administrative leadership style
8. Teacher expectations regarding learning ability of specific students or classes
9. Teacher behavior in the classroom - how the teacher actually carries out the tasks of teaching
10. Student's attitudes and motivation - attitudes toward his performance in school and his motivation for achievement

The following instruments can be used to measure these ten influencing variables:

Socio-economic status

The two most widely used scales for the measurement of socio-economic status are Hollingshead and Redlich's (1953) and Warner's (1960).

Family expectation, attitudes and aspirations

There are several questionnaires in the literature that can be used for the purpose, such as the one used by Coleman, et al. (1966).

Student's self-concepts

Most researchers measure the self-concept by using a self-report or an

inferential technique. Although self-reports are easily administered and involve a minimum of time and cost, they have been severly criticized. Combs and Soper (1957) indicated the following to be factors that affect the responses of the subject to this kind of instrument:

1. The clarity of the individual's awareness
2. The availability of adequate symbols for expression
3. The willingness of the individual to cooperate
4. The social expectancy
5. The individual's feeling of personal adequacy and his feeling of freedom from threat

Thus an inferential technique for the measurement of this variable, such as a picture telling story and critical incidents, is recommended.

Peer group characteristics

Achievement of the peer group can be measured by standardized achievement test scores and/or by the grade point average.

Attitudes and motivation of the peer group can be measured by either self-reports or inferential techniques. The latter is recommended.

Achievement motivation can be measured by a modified Thematic Apperception Test format outlined by McClelland, et al. (1953).

Student's general ability

General ability can be measured by one of the available group tests.

Student's fate control

The Intellectual Achievement Responsibility Questionnaire (IAR), which is a measure of locus of control, can be used to measure this variable. (Crandall, V. C. and Lacy, B. W.)

Administrative leadership of the school

The measure of Executive Professional Leadership developed by Gross and Herriott (1965) can be used to measure this variable.

Teacher expectations

No instrument was found in the review of literature. Most research measured student's outcomes based on biasing statements or false test scores given to the teachers.

Teacher classroom behavior

Many instruments are available that can be used in observing teacher classroom behavior. The following are recommended:

1. Flander's Interaction Analysis
2. Observation Schedule and Record (OScAR)
3. Reciprocal Category System
4. Teacher Practices Observation Record

Student's attitudes and motivation

The same instruments recommended for measuring attitudes and motivation in the case of the peer group characteristics variable can be used for the purpose of measuring this variable.

End Notes

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Appendix A

Membership on Cooperating Panel

The following faculty members of the University of Florida assisted in the study:

Dr. William Alexander - Instructional Leadership

Dr. William Drummond - Instructional Leadership

Dr. Ronald Henderson - Sociology

Dr. Vynce Hines - Educational Research

Dr. Simon Johnson - General Teacher Education

Dr. Solon Kimball - Anthropology

Dr. Ralph Kimbrough - Educational Administration

Dr. Richard Scher - Political Science

Dr. Bert Sharp - Dean, College of Education

Dr. Robert Soar - Educational Research

Dr. Robert Stripling - Counselor Education

Appendix B

Modified Q-Sort Technique

The modified Q-sort technique used the instrument reproduced below. The number in each cell represents the number of choices made. The weighted total was computed by weighting tallies in each column using a factor equal to the reciprocal of the probability that any item would be checked in given column. Since ten items were selected out of fourteen possibilities in column 1, the probability of the selection of any one item is 10 out of 14. The reciprocal weighting factor is, therefore, 14/10 or 1.4. Similar weighting factors were computed for columns 2, 3 and 4 to be 2.33, 4.67 and 14. The weighted total is a summation across the row.

Possible Variables	Out of 14 Select 10 Most Imp. Variable	Out of 10 Select 6 Most Imp. Variable	Out of 6 Select 3 Most Imp. Variable	Out of 3 Select 1 Most Imp. Variable	Weighted Total
Family expectations, attitudes & aspirations	12	10	6	3	110
Peer-group characteristics	12	11	4	1	75
Socio-economic status	11	10	5	4	118
Student's general ability	9	8	6	1	73
Student's self concepts	9	5	3	3	80
Student's attitude and motivation	9	4	4		41
Student's fate control	10	5	2	1	49
Teacher expectations	10	7	3		44
Teacher experience	5	1			9
Teacher behavior in classroon	11	6	3		43
Teacher training	5	1			9
Teacher academic standards	6	1			11
Normative system of the school	10	4	1		28
Administrative leadership	9	5	2	1	48